

REMARKS

Claims 1, 7 and 17 have been amended in order to respond to the Examiner's rejection of the claims under 35 USC 112, second paragraph. That is, the currently presented claims now recite that the oxygen source for the oxide powder is supplied from the starting material powder and/or the carrier gas. Since these amendments respond to a requirement of form made by the Examiner, entry thereof is deemed proper. Accordingly, it is respectfully submitted that the rejection of Claims 1-18 under 35 USC 112, first paragraph, has been overcome.

The specification has been amended in order to correct a numbering error for the Examples. No new matter has been added.

Claims 1-4 have been rejected under 35 USC 103(a) as being unpatentable over Yoshimura et al. Applicants once again respectfully traverse this ground of rejection and urge reconsideration in light of the following comments.

As discussed previously, the instant invention is directed to a method for manufacturing a highly-crystallized oxide powder which involves the steps of ejecting a starting material powder comprising at least one element selected from the group consisting of metal elements and semi-metal elements that will become a constituent component of the oxide into a reaction vessel together with a carrier gas through a nozzle and then heating the starting material powder at a temperature higher than the decomposition temperature or reaction temperature thereof and not lower than $(T_m/2)^{\circ}\text{C}$, where $T_m^{\circ}\text{C}$ stands for the melting point of the oxide which is to be produced, in a state in which the starting material powder is dispersed in a gas phase at a concentration of not higher than 10g/L. The oxygen source for the oxide powder is supplied from the starting material powder and/or the carrier gas. In another embodiment of the present invention, a double oxide powder is produced by a process in which the starting material powder is heated at a temperature higher than the

decomposition temperature or reaction temperature thereof and not lower than $(T_m/2)^{\circ}\text{C}$ of the double oxide which is to be produced.

As explained in the previous Response, the present invention enables the production of a highly-crystallized oxide powder having any desired main particle diameter and a narrow particle size distribution. Since powders are used as a starting material instead of vapors, problems associated with the vapor phase method such as agglomeration of the obtained powder and difficulty of controlling the particle diameter are avoided. The prior art reference cited by the Examiner does not disclose the presently claimed invention.

Yoshimura et al discloses a method for preparing electrically conductive needle-like zinc oxide in which a vapor mixture is prepared by admixing zinc vapor and the vapor or powder of at least one compound selected from the group consisting of dopant-forming compounds having boiling points of not more than the boiling point of zinc and free from oxygen atoms in an amount of 0.005 to 5 parts by weight and passing the vapor mixture to an oxidizing chamber while blowing an oxidizing gas into the vapor mixture through at least two nozzles spaced apart from one another and arranged along the flow path of the vapor mixture to stepwise oxidize the vapor mixture.

Although the Examiner is correct that the Yoshimura et al reference does disclose that the oxygen-free dopant-forming metal compound can be provided in the form of fine powder, the powder is vaporized to form a mixed vapor prior to entering the oxidation chamber for stepwise oxidation of the vapor mixture. Therefore, even if Yoshimura et al does disclose the use of the dopant-forming metal compound as a powder, the compound is vaporized prior to being introduced in a vapor state to the oxidation chamber. Therefore, the oxide of Yoshimura et al is obtained by a vapor phase reaction method, as referred to in paragraphs [0005] and [0007] of the present application.

In the present invention, the starting materials are ejected through a nozzle into a reaction vessel, which corresponds to the oxidation chamber of Yoshimura et al, and heated at a specific temperature in a state in which the starting material powder is dispersed in a gas phase at a concentration of not higher than 10 g/L to produce the intended oxide. That is, in the present invention the starting material is introduced in the reaction chamber in the form of powder and subjected to reaction in the powder state unlike Yoshimura et al's mixed vapor. Therefore, the reaction of the present invention is classified as a solid-phase reaction as opposed to the vapor phase reaction of Yoshimura et al. As discussed in paragraph [0042] of the present application, it is essential that the starting material powder be ejected into a reaction vessel together with a carrier gas through a nozzle and heat treated in a state in which particles of the starting material powder are highly dispersed in a gas phase in the reaction vessel.

Yoshimura et al does not disclose the introduction of the oxidizing gas before the formation of the oxygen-free vapor mixture (column 3, first paragraph) whereas, in the present invention, oxygen is already contained in the starting material powder and/or the carrier gas prior to ejecting them into the reaction vessel. As such, in the present invention, oxygen is not introduced through additional feeding nozzles after the mixing of the reactants.

It has been noted that the Examiner has stated that modifications of the condition of the oxide formation in the present invention is within the skill of the art. However, as pointed out previously, the reaction process of the present invention is different from that of Yoshimura et al and the reaction conditions recited in the claims were specified for the solid-phase reaction process of the present invention which is entirely different from the vapor-phase reaction process of the reference cited by the Examiner. The requirement that the concentration of the starting material

powder in the gas phase have the intended g/L concentration was determined for a starting material powder dispersed in a gas phase in a reaction vessel. This numeral limitation was determined by taking into consideration the collision or sintering of the particles constituting the starting material powder. In contrast thereto, in the Yoshimura et al's method using a vapor phase mixture of zinc and an oxygen-free dopant, collision of the particles cannot occur and the specified concentration of the present invention cannot be deduced from this vapor-phase reaction system. Additionally, the heating temperature defined by the decomposition or reaction temperature of the starting material powder and the melting point of the intended oxide is not taught or suggested from the vapor phase reaction method of Yoshimura et al. The criticality of the heating temperature limitation is discussed in paragraph [0047] of the present invention. Therefore, Applicants respectfully submit that the Yoshimura et al reference does not present a showing of prima facie obviousness under 35 USC 103(a) with respect to the presently claimed invention.

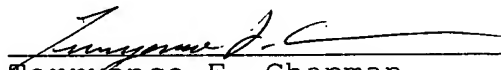
Although Yoshimaru et al does not present a showing of prima facie obviousness under 35 USC 103(a), Applicants respectfully submit that objective evidence of the unobviousness of the presently claimed invention is of record in the present application. Numerous Examples of the present invention and Comparative Examples, corresponding to the prior art, are presented in the present specification which illustrate the criticality of the claimed limitations.

A comparison of Example 1 with Comparative Example 1 and Example 14 with Comparative Example 3 illustrate the criticality of the powder concentration in the gas phase inside the reaction tube. A comparison of Example 1 with Comparative Example 2 and Example 14 with Comparative Example 4 illustrate the criticality of the heating temperature. In the above-described Comparative Examples, only the powder concentration in the reaction tube or the heating temperature

is outside of the claimed range with all other conditions being the same. The test results of the inventive examples are far superior to those of the Comparative Examples. It is respectfully submitted that this is neither taught nor suggested by Yoshimura et al and further establishes the unobviousness of the presently claimed invention thereover.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,


Terryence F. Chapman

TFC/smd

FLYNN, THIEL, BOUTELL
& TANIS, P.C.
2026 Rambling Road
Kalamazoo, MI 49008-1631
Phone: (269) 381-1156
Fax: (269) 381-5465

Dale H. Thiel	Reg. No. 24 323
David G. Boutell	Reg. No. 25 072
Ronald J. Tanis	Reg. No. 22 724
Terryence F. Chapman	Reg. No. 32 549
Mark L. Maki	Reg. No. 36 589
Liane L. Churney	Reg. No. 40 694
Brian R. Tumm	Reg. No. 36 328
Steven R. Thiel	Reg. No. 53 685
Donald J. Wallace	Reg. No. 43 977
Kevin L. Pontius	Reg. No. 37 512
Sidney B. Williams, Jr.	Reg. No. 24 949

Encl: Postal Card

136.07/05